

REMARKS

Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Status of the Claims

Claims 1-3, 10 and 12-18 were currently pending and under active consideration in this application, following entry of this Amendment. Claims 4-7 and claims 19-23 are canceled. Claims 1, 2, 10, 14, 15, 16, 17, and 18 have been amended as discussed below, and claim 1 has been amended to also correct an obvious misspelling.

Claim Objections

Claims 7, 14 and 15 were objected being of improper dependent form. Claim 7 has been canceled and claims 14 and 15 have been amended. It is believed that these objections have been overcome.

Rejection under 35 U.S.C. § 112, First Paragraph

Claims 1-7, 10 and 12-23 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. It is believed that these rejections have been overcome by the amendment made to the claims herein.

Rejections under 35 U.S.C. § 103

The currently-pending claims have been rejected under 35 U.S.C. §103 as follows: (a) claims 1, 2, 7, 10, 12-15, 19 and 20 as being unpatentable over U.S. Patent No. 6,655,845 to Pope (hereafter "Pope"), in view of U.S. Patent No. 5,064,547 to Rubin (hereafter "Rubin"), and further in view of U.S. Patent No. 5,681,506 to Pragnell (hereafter "Pragnell"); (b) claims 1, 2, 10 and 12-15 as being unpatentable over Pope, in view of U.S. Patent No. 5,108,633 to Buckley III (hereafter "Buckley"); (c) claims 3-6, 16-18 and 21-23 as being unpatentable over Pope, in view of Rubin and Pragnell and further in view of U.S. Patent No. 7,067,175 to Veerasamy (hereafter "Veerasamy"); and (d) claims 3-6, 16-18 as being unpatentable over Pope, in view of Buckley, and further in view of Veerasamy. Applicants respectfully traverse these rejections for at least the following reasons.

First, claim 1 and other independent claims have amended to more clearly define the invention, whereby the terms including "carboxylic acids" have been deleted. For the reasons set forth below, it is believed that all the independent claims and claims dependent are thereon patentably distinct from the cited references.

This invention is directed to a low-friction sliding mechanism wherein a low-friction agent composition is interposed between sliding surfaces of a DLC coated sliding member (A) and a sliding member (B). The essential features of the present invention resides in the combination of the following features: (a) a diamond-like carbon of the DLC coated sliding member; and, (b) the low-friction agent composition containing at least one of alcohols, esters, ethers, ketones, aldehydes, carbonates, derivatives thereof, and an aliphatic amine compound (D), in which the oxygen-containing organic compound (C) or the aliphatic amine compound (D) is contained in the range of 0.05 to 3.0 % mass relative to a total mass amount of the low-friction agent composition, in which the aliphatic amine compound (D) has a hydrocarbon group having 6 to 30 carbon atoms.

The combination of the above features (a) and (b) of the present invention can provide very excellent low friction characteristics (actually, excessively low friction coefficients) which cannot be realized under a conventional lubrication theory. These unexpected results are described in the specification as originally filed. The excessively low friction coefficient obtained by the combination is, for example, at a high level of 0.029 or 0.037 as compared with a conventional low level of 0.132 or 0.148.

Second, regarding the cited references: (a) Pope et al disclose a bearing having roller and race whose surface is coated with polycrystalline diamond; (b) Rubin discloses a lubricant composition containing saturated dicarboxylic acid having 6 to 32 carbon atoms (see claim 1); (c) Pragnell et al disclose a corrosion inhibiting lubricant composition containing a saturated or unsaturated dicarboxylic acid (see column 1, lines 35-40); and, (d) Buckley III discloses a lubricating oil composition containing a long chain aliphatic hydrocarbyl amine having a long chain aliphatic hydrocarbyl component having a chain length of at least 50 carbon atoms (see claim 1). Each is missing important aspects of the claimed invention.

Third, concerning the Examiner's rejection on claims 1 and 10 under 35 U.S.C. 103(a) over Pope in view of Rubin and further in view of Pragnell, both Rubin and Pragnell

(disclosing carboxylic acid) are not tenable as pertinent citations because the term “carboxylic acids” is deleted from the independent claims of the present application. Accordingly, Pope et al, Rubin and Pragnell cannot render the present invention obvious taken in combination. Additionally, it is a matter of course that neither of Pope, Rubin nor Pragnell teaches the combination of diamond-like carbon and a low friction agent composition containing the claimed particular organic compound, and the significant advantages gained thereby. Further, none of the above three cited references teaches the claimed content ranges (0.05 to 3.0 % mass) of the oxygen-containing organic compound and the aliphatic amine compound.

Fourth, concerning the Examiner’s rejection on claims 1 and 10 over Pope in view of Buckley III (discloses the long chain aliphatic hydrocarbyl amine), in Buckley III the long chain hydrocarbyl component of the long chain aliphatic hydrocarbyl amine has at least 50 carbon atoms; however, the aliphatic amine compound of the present invention (as claimed) has carbon atoms ranging from 6 to 30. Therefore, the aliphatic amine compound disclosed in this reference is outside the range of the present invention. Additionally, this aliphatic hydrocarbyl amine is used as dispersants and not for the purpose of lowering friction as in the present invention.

In response, the Examiner asserts (on page 15) that “Buckley III does not indeed say that one of the preferred long chain amines has at least 50 carbon atoms, however, Buckley III also discloses that the carbon lengths used in lubricating oil can also be between 6 and 12 when employing synthetic oil, see column 12 lines 5-37”. However, we strongly disagree with this assertion. As a matter of fact, the “carbon length between 6 and 12” pointed by the Examiner is a carbon chain length of alpha olefin which is a raw material of PAO serving as a synthetic base oil. Thus, the “carbon length between 6 and 12” pointed by the Examiner has no relation to the carbon chain length of the aliphatic amine compound of the present invention. Hence, Buckley III is not tenable as a pertinent citation.

Accordingly, Pope and Buckley III cannot render the present invention obvious taken in combination. Additionally, it is a matter of course that neither of Pope and Buckley III teaches the combination of diamond-like carbon and a low friction agent composition containing the claimed particular organic compound, and the significant advantages gained thereby. Further, neither of Pope and Buckley III teaches the claimed content ranges (0.05 to 3.0 % mass) of the oxygen-containing organic compound and the aliphatic amine compound.

Double Patenting Rejection

Claims 4-6 have been cancelled, so it is believed that this double patenting has been overcome.

Conclusion

Applicants believe that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested. The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application. The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing or a credit card payment form being unsigned, providing incorrect information resulting in a rejected credit card transaction, or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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